

Research Note

Gastrointestinal Helminths of the Japanese Treefrog, *Hyla japonica* (Anura: Hylidae), from Japan

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ABSTRACT: Of 104 *Hyla japonica* examined, 38 (37% prevalence) harbored helminths. The cestode *Cylindrotaenia japonica* (prevalence 11%, mean intensity 2.5) and the nematodes *Cosmocerca japonica* (prevalence 20%, mean intensity 2.1) and *Oswaldocruzia insulae* (8% prevalence, 1.9 mean intensity) were found. *Oswaldocruzia insulae* in *Hyla japonica* represents a new host record.

KEY WORDS: Cestoda, *Cylindrotaenia japonica*, Nematoda, *Cosmocerca japonica*, *Oswaldocruzia insulae*, Hylidae, *Hyla japonica*.

The Japanese treefrog, *Hyla japonica* Günther, 1859, is a hylid frog occurring on Goto, Hokkaido, Honshu, Iki, Kyushu, Osumi, Shikoku, Tsushima, and Sado islands, Japan (Nakamura and Uéno, 1970) as well as in Korea, central Mongolia, northeastern China, and eastern Russia (Frost, 1985). Uchida (1975) listed, without comment, the cestode *Cylindrotaenia* (= *Baerietta*) *japonica* (Yamaguti, 1938) Jones, 1987, and the nematodes *Rhabdias* (= *Angiostoma*) *bufonis* (Schränk, 1788) Stiles and Hassall, 1905, and *Cosmocerca japonica* Yamaguti, 1938 as parasites of *H. japonica*. The purpose of this note is to report the results of a survey of gastrointestinal helminths of *H. japonica*.

One hundred four adult (80 male, 24 female) *Hyla japonica* (mean snout–vent length 29.8 ± 3.1 mm SD, range 20–37) were examined. Sixty-nine (55 male, 14 female) were collected at Beppu, Oita Prefecture, Kyushu Island, Japan (33°17'N, 131°26'E ca. 300 m elevation) 7 June 1992, 22 (17 male, 5 female) were collected at Gotemba, Shizuoka Prefecture, Honshu Island, Japan (35°18'N, 138°56'E ca. 476 m elevation) 27 May and 2 June 1993 and 13 (8 male, 5 female) were collected at Odawara, Kanagawa Prefecture, Honshu Island, Japan (35°15'N, 139°10'E ca. 152 m elevation) 20 October 1993.

The body cavity was opened ventrally and the esophagus, stomach, small intestine, and large intestine were slit longitudinally and examined under a dissecting microscope. The liver and body

cavity were also examined for helminths. All helminths were identified utilizing a glycerol wet mount. Selected cestodes were stained with hematoxylin and mounted whole in Canada balsam.

Thirty-one of 80 males and 7 of 24 females were parasitized, 38/104 (37% prevalence). *Cylindrotaenia japonica* (11% prevalence, 2.5 mean intensity, range 1–5) and *Oswaldocruzia insulae* Morishita, 1926 (8% prevalence, 1.9 mean intensity, range 1–4) were found in the small intestines while *Cosmocerca japonica* (20% prevalence, 2.1 mean intensity, range 1–5) was found in both the small and large intestines. There was no significant difference in prevalence of infection between male and female frogs (chi-square = 0.35, 1 df, $P > 0.05$).

The Beppu population harbored *Cylindrotaenia japonica* (4 of 55 male frogs, 0 of 14 female frogs), *O. insulae* (6 males, 2 females), and *Cosmocerca japonica* (5 males). Two males harbored co-parasites: 1 *Cylindrotaenia japonica* and 2 *O. insulae* in one and 1 *Cylindrotaenia japonica* and 1 *Cosmocerca japonica* in the other. The Gotemba population harbored only *Cosmocerca japonica*; 16 of 22 (13 of 17 males, 3 of 5 females) were infected as compared to 5 of 69 from Beppu. The Odawara population harbored only *Cylindrotaenia japonica* 7 of 13 (5 of 8 males, 2 of 5 females) as compared to 4 of 69 from Beppu. The prevalence of infection for the 3 populations was statistically different (chi-square = 8.65, 2 df, $P < 0.05$).

Selected helminth specimens were placed in 70% alcohol in glass vials and deposited in the U.S. National Parasite Collection (Beltsville, Maryland 20705); *Cylindrotaenia japonica* Beppu (83291), Odawara (83395); *Cosmocerca japonica* Beppu (83292), Gotemba (83338); *O. insulae* Beppu (83293). All frog specimens were deposited in the herpetology collection of the Natural History Museum of Los Angeles County

Table 1. Amphibian hosts from Japan for the helminths recovered from *Hyla japonica*.

Helminth	Host	N	Prevalence (%)	Reference
<i>Cylindrotaenia japonica</i>	<i>Hyla japonica</i>	—	—	Uchida, 1975
		—	—	Jones, 1987
		104	11	This note
	<i>Rana japonica</i>	—	—	Uchida, 1975
		—	—	Jones, 1987
	<i>Rana ornativentris</i>	—	—	Jones, 1987
<i>Cosmocerca japonica</i>	<i>Rhacophorus schlegelii</i>	—	—	Uchida, 1975
	<i>Rhacophorus viridis</i>	— a*	—	Jones, 1987
	<i>Buergeria japonica</i>	23 a	13	Hasegawa, 1989
	<i>Bufo japonicus</i>	—	—	Uchida, 1975
	<i>Bufo melanostictus</i>	—	—	Uchida, 1975
	<i>Cynops ensicauda</i>	94 a	3	Hasegawa, 1989
	<i>Hyla japonica</i>	—	—	Yamaguti, 1938
		104	20	This note
	<i>Microhyla ornata</i>	12 a	92	Hasegawa, 1989
	<i>Polypedates leucomystax</i>	9 a	11	Hasegawa, 1989
	<i>Rana ishikawae</i>	4 a	25	Hasegawa, 1989
	<i>Rana japonica</i>	—	—	Yamaguti, 1938
	<i>Rana limnocharis</i>	135 a	41	Hasegawa, 1989
		6 b	33	Hasegawa, 1989
		7 c	57	Hasegawa, 1989
		4 d	100	Hasegawa, 1989
	<i>Rana narina</i>	40 a	30	Hasegawa, 1989
	<i>Rana nigromaculata</i>	—	—	Yamaguti, 1938
<i>Oswaldocruzia insulae</i>	<i>Rana ornativentris</i>	—	—	Uchida, 1975
	<i>Rana rugosa</i>	—	—	Yamaguti, 1938
	<i>Bufo japonicus</i>	—	—	Uchida, 1975
	<i>Bufo gargarizans miyakonis</i>	20 b	95	Hasegawa, 1989
	<i>Bufo japonicus formosus</i>	—	60	Morishita, 1926
	<i>Hyla japonica</i>	104	8	This note
	<i>Rana rugosa</i>	—	—	Morishita, 1926

* a = From Okinawa; b = from Miyako; c = from Iriomote; d = from Yonaguni islands.

(Beppu LACM 140421–140489; Gotemba 140784–140805; Odawara 140888–140900).

None of the parasites found in this study are unique to *H. japonica* (Table 1). *Cylindrotaenia japonica*, a parasite of the small intestine, has a limited geographical distribution and has been reported only from anurans. Although nothing is known of its life cycle, Joyeux (1924) considers the life cycle of *Cylindrotaenia americana* Jewell, 1916 to be direct with infection occurring when a contaminated fecal pellet is swallowed by a frog.

Cosmocerca japonica, a parasite primarily of the rectum, has a similar geographical distribution pattern to *Cylindrotaenia japonica* but has been reported from a greater number of anurans. Hasegawa (1989) suggested a synonymy of *Cosmocerca japonica* with *C. ornata* (Dujardin, 1861) Diesing, 1861, which has been found in all biogeographic realms except the Nearctic and Australian (Baker, 1987); but further review is nec-

essary before this synonymy can be accepted. The life cycle of *C. japonica* is not known. However, the life cycle of *Cosmocerca commutata* (Diesing, 1851) Diesing, 1861 (= *Cosmocerca kashmirensis* Fotedar, 1959 sensu Baker, 1987) was studied by Fotedar and Tikoo (1968). Eggs hatched in 2–4 hr. Larvae penetrated the skin of *Bufo viridis* and migrated through the viscera reaching the lungs 3 days postinfection and the rectum 10–14 days postinfection.

Oswaldocruzia insulae, a parasite of the small intestine, is more limited in geographical distribution than the other 2 species reported here and is restricted to Japan (Baker, 1987). It should be noted that Travassos (1937) synonymized *O. insulae* and *O. socialis* Morishita, 1926 with *O. filiformis* (Goeze, 1782) Travassos, 1917 which has a wide distribution in Europe; but this synonymy requires confirmation (Baker, 1987). The life cycle of *O. insulae* is not known, however Baker (1978) reported that in *Oswaldocruzia pip-*

iens Walton, 1929, development to infective larvae occurred in fecal pellets with transmission to new hosts by skin penetration. *Hyla japonica* is a new host record for *O. insulæ*.

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Literature Cited

- Baker, M. R.** 1978. Development and transmission of *Oswaldocruzia pipiens* Walton, 1929 (Nematoda: Trichostrongylidae) in amphibians. Canadian Journal of Zoology 56:1026–1031.
- . 1987. Synopsis of the Nematoda parasitic in amphibians and reptiles. Memorial University of Newfoundland, Occasional Papers in Biology 11: 1–325.
- Fotedar, D. N., and R. Tikoo.** 1968. Studies on the life cycle of *Cosmocerca kashmirensis* Fotedar, 1959, common oxyurid nematode parasite of *Bufo viridis* in Kashmir. Indian Science Congress Association Proceedings 55:460.
- Frost, D. R., ed.** 1985. Amphibian Species of the World. A Taxonomic and Geographical Reference. Allen Press, Inc., and Association of Systematic Collections, Lawrence, Kansas. 732 pp.
- Hasegawa, H.** 1989. Nematodes of Okinawan amphibians and their host–parasite relationship. Pages 205–217 in M. Matsui, T. Hikida, and R. C. Goris, eds. Current Herpetology in East Asia. Herpetological Society of Japan, Kyoto.
- Jones, M. K.** 1987. A taxonomic revision of the Nematotaeniidae Lühe, 1910 (Cestoda: Cyclophyllidae). Systematic Parasitology 10:165–245.
- Joyeux, C. E.** 1924. Recherches sur le cycle évolutif des *Cylindrotaenia*. Annales de Parasitologie Humaine et Comparée 2:74–81.
- Morishita, K.** 1926. Studies on some nematode parasites of frogs and toads in Japan, with notes on their distribution and frequency. Journal of the Faculty of Science Imperial University of Tokyo 1:1–32.
- Nakamura, K., and S. Uéno.** 1970. Japanese Reptiles and Amphibians in Colour. Hoikusha Publishing Company, Osaka, Japan. 214 pp.
- Travassos, L.** 1937. Revisão da família Trichostrongylidae Leiper, 1912. Monographias do Instituto Oswaldo Cruz 1:1–512.
- Uchida, A.** 1975. Check list of the helminth parasites of Japanese amphibians. Bulletin of the Azabu Veterinary College 30:63–81.
- Yamaguti, S.** 1938. Studies on the helminth fauna of Japan. Part 23. Two new species of amphibian nematodes. Japanese Journal of Zoology 7:603–607.

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Research Note

Glythelmins pennsylvaniensis (Trematoda: Digenea) in the Spring Peeper, *Pseudacris c. crucifer* (Anura: Hylidae), from Southwestern West Virginia

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ABSTRACT: Fifty-one of 120 northern spring peepers, *Pseudacris c. crucifer* (Wied-Neuwied 1838), collected from 3 different habitats in Wayne County, West Virginia were infected by *Glythelmins pennsylvaniensis* Cheng, 1961. The lowest mean intensity (2.5) of infection was recorded from hosts in a temporary ditch habitat, while the highest mean intensity (8.9) was recorded for hosts collected in 1 of 2 marsh sites. There was no significant difference between the size (as weight) of infected versus uninfected hosts. There was a slight negative correlation between host weight and the number of *G. pennsylvaniensis* individuals present (i.e., larger hosts had fewer trematodes), but the regression coefficient was not significant (i.e., $b = 0$).

KEY WORDS: *Glythelmins pennsylvaniensis*, *Pseudacris c. crucifer*, spring peeper, West Virginia.

The northern spring peeper, *Pseudacris c. crucifer*, is a small anuran that ranges from Ontario, Quebec, and southeastern Manitoba, south to northern Florida and eastern Texas (Green and Pauley, 1987). This springtime breeder is abundant in areas of brushy growth near small temporary or semipermanent ponds or swamps. There are no reports of parasites from this host species in West Virginia. After recovering specimens of *Glythelmins pennsylvaniensis* Cheng 1961, from a small sample population of spring peepers in Wayne County, West Virginia, we set out to broaden our study to determine preva-